

REMARKS

Reconsideration and allowance of the present application are respectfully requested. Claims 1-20, 22, 23, 25, 27, 28 and 30 remain pending in the application. By the foregoing amendment, claims 1-4, 8-10, 12, 15, 18, 20, 22 and 25 are amended; and claims 32 and 33 are canceled.

Applicants note with appreciation the Examiner's indication in the final Office Action that claims 4-6, 11, 15, 16, 18-20, 23 and 28 are allowed; and claim 33 contains allowable subject matter. In response, claim 12 is amended to incorporate the allowable subject matter of claim 33. Further, independent claims 1, 8 and 10 are amended to variously incorporate the allowable subject matter originally indicated for claim 4. Applicants respectfully submit that the application is now in condition for allowance.

On page 2 of the final Office Action, the Examiner rejects claim 32 under 35 U.S.C. §112, second paragraph. To address the Examiner's concerns, the physical actuation feature of the at least one micro-electromechanical device is restated in the base claim, canceling claim 32. Withdrawal of the rejection under 35 U.S.C. §112, second paragraph, is respectfully requested.

On pages 2 and 3 of the final Office Action, the Examiner variously objects to claims 1, 3, 4, 8, 9, 10, 12, 15, 18, 20 and 32. To address the Examiner's concerns, the relevant claims are amended. Withdrawal of the objections is respectfully requested.

On page 4 of the final Office Action, independent claims 1, 8, 10 and 12, along with various dependent claims, are rejected as being unpatentable over JP A

60-72301 (Morooka) over U.S. Patent 4,575,697 (Rao et al.). This rejection is respectfully traversed.

An inline phase shifter is disclosed. Included with the device are a waveguide and at least one electromechanical means for changing a physical dimension of a waveguide path. As shown in Figs. 1 and 2, a waveguide 102 has at least one electrically conducting surface and a waveguide path. At least one electromechanical means 106, 108, 110, 112, 114 and 116 can be used to change a physical dimension of a waveguide path to phase shift a signal which travels along the waveguide path, such as a piezoelectric device 310 as shown in Fig. 3, or an electrostatically actuated shutter 524, 526 as shown in Figs. 5 and 6 (e.g., specification at paragraph [0029]). In either case, an electromechanical means has a moveable shutter for changing a physical dimension of the waveguide path (e.g., specification at paragraphs [0019] and [0029]). The electromechanical means can be a micro-electromechanical device which can be contained within the waveguide, as shown Figs. 4 and 5.

As shown in Fig. 2, surfaces of shutters can be electrically connected to a surface of the waveguide 202 with conductive means (paragraph [0020]). The conducting surface configured with electrically connected shutters can alter the dimensions of the conducting surface via actuation of shutters. As exemplified in Fig. 4, the admittance Y along the waveguide path 404 can be modeled to use impedance matching techniques of transmission line theory. In one instance, the combination of openings is chosen via actuation of shutters so that the desired amount of phase shift and impedance match is achieved (specification at paragraph [00025]). The sets of arrays can also be variously tuned for impedance matching

purposes (specification at paragraph [00034]). The impedance matching as Applicants have disclosed can minimize reflection coefficient over a wider frequency bandwidth.

The foregoing features are broadly encompassed by claim 1 which recites an inline phase shifter including, among other features, a waveguide having at least first and second electrically conducting surfaces and a waveguide path; and at least first and second electromechanical means for changing a physical dimension of the waveguide path to phase shift a signal which travels along the waveguide path, wherein each of the at least first and second electromechanical means comprises either a piezoelectric element or an electrostatically actuated shutter, wherein the shutters are electrically connected to the respective electrically conducting surface for providing phase shift and impedance matching, and wherein the first electromechanical means has a first shutter that can move toward the second surface and the second electromechanical means has a second shutter that can move toward the first surface.

The Morooka publication does not teach or suggest a shutter being electrically connected to an electrically conducting surface for providing phase shift and impedance matching, wherein a first electromechanical means has a first shutter that can move toward a second surface and a second electromechanical means has a second shutter that can move toward a first surface, as recited in claim 1. The recited claim feature incorporates the allowable subject matter from claim 4.

The Rao et al. patent does not cure the deficiencies of the Morooka publication. The Rao et al. patent discloses a bimorph member causing a dielectric wafer to insert into a waveguide by cantilever action. However, the Rao et al. patent

does not teach or suggest a shutter being electrically connected to an electrically conducting surface for providing phase shift and impedance matching, wherein a first electromechanical means has a first shutter that can move toward a second surface and a second electromechanical means has a second shutter that can move toward a first surface, as recited in claim 1. Claims 8 and 10 are similarly amended.

For the foregoing reasons, Applicant's claims 1, 8, 10 and 12 are allowable. The remaining rejected claims depend from the independent claims and recite additional advantageous features which further distinguish over the documents relied upon by the Examiner. As such, the present application is in condition for allowance.

All objections and rejections raised in the Office Action having been addressed, it is respectfully submitted that the application is in condition for allowance and a Notice of Allowance is respectfully solicited.

Respectfully submitted,

BUCHANAN INGERSOLL & ROONEY PC

Date: August 10, 2006

By:


48,360
for Patrick C. Keane
Registration No. 32858

P.O. Box 1404
Alexandria, VA 22313-1404
703 836 6620